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EXAMINER

ABRAMOWITZ, HOWARD E

ART UNIT

PAPER NUMBER

1762

DATE MAILED: 07/11/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/810,912

Applicant(s)

LI ET AL.

Examiner

Howard E. Abramowitz

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 April 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-3, 5-8 and 10-12 is/are rejected.
- 7) ☒ Claim(s) 4, 9 and 13-20 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on 26 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

Applicant's amendments filed 4/23/06, have been fully considered and reviewed by the examiner. The examiner notes that claims 1, 5 and 10 have been amended and that claims 14-20 have been added. Currently claims 1-20 are pending in the application.

Response to Arguments

Applicant's arguments filed 4/23/06 have been fully considered but they are not persuasive.

The applicant has argued that the 112 first paragraph written description rejection is incorrect and that support exists at paragraph 40 of the specification for the terms "carbon-containing gas" and "nitrogen-containing gas". The applicant points to case law which states "mention of representative compounds may provide an implicit description on which to base generic claim language".

The examiner disagrees with the assertion that the disclosed species in the specification form a representative group. The applicant's specification discloses one example of each gas ammonia and carbon dioxide for the "nitrogen-containing gas" and the "carbon-containing gas" respectively. Thus the specification does not disclose representative species as the applicant asserts but rather one single species which one of ordinary skill would not deem encompassing of the genus of all nitrogen and carbon gases. Additionally, the case law cited by the applicant requires plural "compounds" to

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base generic claim language not a single compound. Therefore the notion that a single compound can be used to give an "implicit description on which to base generic claim language" is refuted by the case law which distinctly requires plural compounds to use such generic claim language. From this one of ordinary skill would not find the applicant's disclosure enabling for the broad categories of "nitrogen-containing gas" and the "carbon-containing gas" but rather would find it enabling only for the singly listed examples that are disclosed.

Referring to the art rejections, the amendments to the claims has overcome the rejections from the previous office action. Specifically the limitation that the cleaning process comprises a chlorine containing gas. Accordingly the rejections have been withdrawn.

Claim Rejections - 35 USC § 112

Claims 1, 3-6, 8-10 and 12-20 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Specifically, amended **Claims 1, 3 – 6, 8 – 10, 12, and 13** all recite that the seasoning film is provided on the interior surfaces of the chamber by introducing precursor gases selected from, for example, (1) dichlorosilane and a nitrogen-containing

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gas (e.g., to form a silicon nitride seasoning film), and (2) trimethylsilane and a carbon-containing gas (e.g., to form a silicon carbide seasoning film). However, the originally filed specification only disclosed forming a silicon nitride film from dichlorosilane and ammonia (see paragraphs [0022], [0031], and [0040] of the specification) and forming a silicon carbide film from trimethylsilane and carbon dioxide (see paragraphs [0031] and [0040]). There is no original disclosure (either explicit, implicit, or inherent) of using the broad genus of "nitrogen-containing gas" or "carbon-containing gas" to deposit a silicon nitride or silicon carbide seasoning film, respectively. The disclosure of a single species of nitrogen-containing gas (i.e., ammonia) and a single species of carbon-containing gas (i.e., carbon dioxide) is not sufficient to reasonably convey to one skilled in the art that the applicant originally had possession of the broad genus of gases now claimed. Please note that Claims 2, 7, and 11 have not been rejected on this basis because the originally filed specification does have support for depositing a silicon dioxide seasoning film from silane and an oxygen-containing gas (see paragraph [0021] of the specification).

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 4 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Claim 4 recites that the seasoning film is a silicon carbide film and that the precursor gases are trimethyl silane and said carbon containing gas.

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However, claim 1 is limited to a nitrogen containing gas and an oxygen containing gas with no mention of a carbon containing gas. Accordingly, the claim will be examined as though the trimethyl silane and carbon containing gas were considered in claim 1 as possible precursor gases.

Claim Objections

Claim 1 objected to because of the following informalities: the word "and" should be present between "oxygen-containing gas, dichlorosilane" as the language is closed regarding the group of precursors so that it reads "oxygen-containing gas, and dichlorosilane". Appropriate correction is required.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation

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under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1, 3, 5, 8, 10, 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Timmermans et al. (US Patent No. 6,974,781) in view of Inaba et al. (US Patent No. 5,629,043).

Referring to claims 1, 5 and 10, Timmermans discloses forming a silicon nitride seasoning film on the interior surfaces of a process chamber using dichlorosilane and ammonia as the precursor gases at a temperature of 700 °C. (column 4 lines 9-15, column 3 lines 49-64). It discloses that the film thickness should be 50 nm or greater this would encompass 2-10 micrometers. It discloses cleaning the chamber prior to the seasoning layer deposition the cleaning process can comprise a chlorine containing gas ClF_3 (column 6 lines 14-19). It does not disclose that the pressure of the process chamber during the deposition be between 10 and 760 Torr. However, Inaba et al. discloses that when forming a silicon nitride film from dichlorosilane and ammonia it is desirable to have the pressure be between 100 and 300 Torr as this pressure range helps prevent oxidation of the deposited film (abstract). Accordingly it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Timmermans et al. to deposit the silicon nitride film at a pressure between 100 and 300

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Torr as suggested by Inaba et al. with an expectation that depositing at these pressures will help prevent oxidation of the film.

Timmermans in view of Inaba et al. does not teach a deposition time for the modified method using the pressures of Inaba et al.. While Timmermans teaches a time of 150 min. this time is for the conditions used in its deposition and the deposition process of Inaba et al. accordingly one of ordinary skill would expect the time needed to deposit the film to be different for the different process conditions. It is well known that the deposition time effects the thickness of the deposited film. Therefore the deposition time is a result effective parameter in that it effects the film thickness. It would have been obvious to have adjusted the deposition time to values in the claimed ranges through routine experimentation so as to optimize the thickness of the film, especially in the absence of a showing of a criticality for using values in the claimed ranges.

Timmermans also teaches that the silicon nitride seasoning layer will act to prevent deposition of the process gases onto the chamber walls (column 3 lines 26-64).

Timmermans does not teach a plasma deposition of silicon but rather a thermal deposition of silicon nitride. However there is no active step of depositing a silicon layer by plasma deposition in claim 1 so Timmermans in view of Ibana does not need to deposit that layer.

Referring to claims 3, 8, and 12, Timmermans discloses forming the silicon nitride layer from dichlorosilane and ammonia.

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Claims 2, 6, 7 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Timmermans et al. in view of Inaba et al. in further view of Rossman et al. (US Patent No. 6,121,161).

Referring to claims 2, 6, 7 and 11, Timmermans et al. in view of Inaba et al. teach all of the features of the claims as discussed above except they do not teach that the seasoning film comprises silicon oxide. Rossman et al. teaches that when applying a seasoning layer of silicon nitride to chamber surfaces it is desirable to first deposit a silicon oxide layer from silane and oxygen as it helps better adhere the silicon nitride layer (column 3 lines 16-32, column 9 lines 37-45).

Allowable Subject Matter

Claims 4, 9, 13-20 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Referring to claim 4, 9 and 13, the prior art neither discloses or deems obvious using a silicon carbide seasoning layer. The prior art teaches the advantages of using a silicon nitride layer and combining that with a silicon oxide layer but it does not teach silicon carbide. Regarding claim 4 specifically, the limitation of the precursor gases is missing from the closed language of claim 1 as mentioned above, however inclusion of those precursor gases into the closed group of claim 1 would render that claim objected.

Referring to claims 14-20, the prior art does not teach or suggest applying silicon oxide nitride or carbide seasoning film to protect against the deposition of silicon but

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rather to protect against the deposition of silicon nitride. European patent No. 1,154,037 teaches to deposit a silicon oxide or nitride film onto the reactor surfaces however the purpose of this seasoning layer is to prevent contamination from fluorine leftover from the cleaning process and not to prevent deposition of silicon on the chamber walls (paragraph 20). It teaches that the film being deposited can be amorphous silicon (paragraph 2). It also teaches using a fluorine cleaning gas and not a gas that comprises chlorine. Because the purpose of the seasoning layer is to prevent fluorine from contaminating the process of coating the wafers and not to prevent deposition on the walls of the reactor and the cleaning gas comprises fluorine and not chlorine it would not be obvious to combine the reference with the references used in the rejection of the independent claims as there is no motivation for combining the references.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the

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shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Howard E. Abramowitz whose telephone number is 571-272-8557. The examiner can normally be reached on monday-friday 9:00-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy H. Meeks can be reached on 571-272-1423. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.


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